

CLAIMS

1. An optical network comprising:

5 a optical fiber carrying light signals of a plurality of wavelengths, each wavelength defining a communication channel for said optical network;

a plurality of add couplers connected to said optical fiber, each add coupler inserting light signals of at least one wavelength into said optical fiber;

a plurality of drop couplers connected to said optical fiber, each drop coupler splitting said light signals of said plurality of wavelengths from said optical fiber; and

10 a plurality of wavelength blocker units connected to said optical fiber, each wavelength blocker unit filtering out optical signals at selected wavelengths on said optical fiber and distributed among groups of said pluralities of add and drop couplers so that each segment of said optical fiber between pairs of neighboring wavelength blocker units has at least three add and drop couplers.

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2. The optical network of claim 1 wherein each segment has the following relationship:

$$\text{THRU} + \text{ADD} + \text{DROP} + \text{LOCAL} \leq \text{TOTAL}$$

holds true, where THRU is the number of channels passing through said segment; ADD
20 is the number of channels added within said segment; DROP the number of channels

dropped within said segment; LOCAL the number of channels confined within said segment; and TOTAL is the total capacity of said optical fiber.

5 3. The optical network of claim 2 wherein said pluralities of add and drop couplers are organized into a plurality of add/drop nodes, each add/drop node having an add coupler and a drop coupler, said plurality of add/drop nodes further comprising a first set of add/drop nodes, each first set add/drop node further including a wavelength blocker unit, and a second set of add/drop nodes, each second set add/node node having no
10 wavelength blocker unit.

 4. The optical network of claim 1 further comprising a plurality of optical amplifiers connected to and distributed along said optical fiber, and wherein said wavelength blocker units are combined with said optical amplifiers.

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 5. The optical network of claim 4 wherein a combination of wavelength blocker units and optical amplifiers comprises:

 a first optical amplifier stage having an input terminal for connection to said optical fiber and an output terminal;

20 a second optical amplifier stage having an input terminal and an output terminal connected to said optical fiber; and

a wavelength blocker unit connected to said output terminal of said first amplifier stage and said input terminal of said second amplifier stage.

5 6. The optical network of claim 1 wherein at least one of said plurality of add couplers and at least one of said plurality of drop couplers are combined in a single device having four terminals, first and second terminals connected to said optical fiber to provide an optical path therethrough, a third terminal for an optical path for signals split from said optical fiber, and a fourth terminal for an optical path for signals to be added to
10 said optical fiber.

 7. The optical network of claim 6 wherein said third terminal is connected to a plurality of wavelength filters connected in a serial cascade arranged so that for any pair of wavelength filters, a wavelength filter first receiving signals from said single device
15 diverting signals at one or more predetermined wavelengths to a first receiver and transmitting signals at wavelengths other than said one or more predetermined wavelengths to a second wavelength filter, said second wavelength filter diverting said transmitted signals at at least one or more wavelengths to a second receiver.

20 8. The optical network of claim 1 wherein at least one drop coupler is connected to a plurality of wavelength filters connected in a serial cascade arranged so

that for any pair of wavelength filters, a wavelength filter first receiving signals from said drop coupler diverting signals at one or more predetermined wavelengths to a first receiver and transmitting signals at wavelengths other than said one or more predetermined wavelengths to a second wavelength receiver, said second wavelength receiver diverting said transmitted signals at at least one or more wavelengths to a second receiver.

9. The optical network of claim 8 wherein said wavelength filters comprise low-pass filters.

10. The optical network of claim 8 wherein said wavelength filters comprise high-pass filters.

11. The optical network of claim 8 wherein said wavelength filters comprise bandpass filters.

12. For an optical network having an optical fiber carrying signals of a plurality of wavelengths, each wavelength defining a communication channel for said optical network, a combination comprising:

a first optical amplifier stage having an input terminal for connection to said optical fiber and an output terminal;

a second amplifier stage having an input terminal and an output terminal
5 connected to said optical fiber; and

a wavelength blocker unit connected to said output terminal of said first amplifier stage and said input terminal of said second amplifier stage, said wavelength blocker unit preventing signals of one or more predetermined wavelengths from passing from said first optical amplifier input terminal to said second optical amplifier output terminal;

10 whereby signals not of one or more predetermined wavelengths are amplified in said optical fiber and signals of one ore more predetermined wavelengths are blocked.

13. For an optical network having an optical fiber carrying signals of a plurality of wavelengths, each wavelength defining a communication channel for said optical network, a combination comprising:
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a coupler connected to said optical fiber, said coupler splitting signals of said plurality of wavelengths from said optical fiber; and

a plurality of wavelength filters connected in a serial cascade arranged so that for any pair of wavelength filters, a wavelength filter first receiving signals from said coupler
20 diverting signals at one or more predetermined wavelengths to a first receiver and transmitting signals at wavelengths other than said one ore more predetermined

wavelengths to a second wavelength receiver, said second wavelength receiver diverting said transmitted signals at at least one or more wavelengths to a second receiver.

5 14. The optical network of claim 13 wherein said wavelength filters comprise low-pass filters.

 15. The optical network of claim 13 wherein said wavelength filters comprise high-pass filters.

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 16 The optical network of claim 13 wherein said wavelength filters comprise bandpass filters.

 17. An optical network comprising:

15 a optical fiber carrying light signals of a plurality of wavelengths, each wavelength defining a communication channel for said optical network;

 a plurality of means connected to and distributed along said optical fiber for inserting light signals of different wavelength into said optical fiber and for splitting said light signals of said plurality of wavelengths from said optical fiber; and

a plurality of means connected to and distributed along said optical fiber for filtering out optical signals at selected wavelengths on said optical fiber and distributed among groups of inserting and splitting means and numbering less than said plurality of
5 inserting and splitting means.

18. The optical network of claim 17 wherein each segment of said optical fiber between pairs of filtering out means has the following relationship:

$$\text{THRU} + \text{ADD} + \text{DROP} + \text{LOCAL} \leq \text{TOTAL}$$

10 holds true, where THRU is the number of channels passing through said segment; ADD is the number of channels added within said segment; DROP the number of channels dropped within said segment; LOCAL the number of channels confined within said segment; and TOTAL is the total capacity of said optical fiber.